CARBONATED SOFT DRINK PACKAGING IN ONTARIO: AN ENVIRONMENTAL REAPPRAISAL

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Waste
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Prepared for the Ontario
Waste Management Advisory Board

by

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O U T L I N E

SECTION 1

EXECUTIVE SUMMARY

1.1 Introduction and Background

On July 19, 1979, the Ontario Soft Drink Association (OSDA) presented a submission to Doctor Parrott, the Ontario Minister of the Environment, requesting approval to introduce the two-litre plastic (PET) non-refillable bottle for use in the Ontario carbonated soft drink industry. Approval would require modifications in Ontario Regulations 998/75 (which bans non-refillable plastic bottles for carbonated soft drinks) and 687/76 (which does not allow a two-litre size).

The request comes in the wake of action by Consumer and Corporate Affairs Canada to ban all 1.5 litre refillable bottles which fail to meet a "tipping" test that is described in new Federal regulations under The Hazardous Products Act. There has been a recent increase in reported injuries which relate directly to the use of 1.5 litre refillable glass bottles.

About twenty per cent of Ontario containerized gallonage sales is marketed in the 1.5 litre refillable glass bottle, and approximately forty per cent is sold in 750 ml. refillable glass bottles. Although the Federal regulations only apply to 1.5 litre bottles, officials at Consumer and Corporate Affairs Canada have indicated that in the future they will be testing the 750 ml. size. There is concern in the industry that many 750 ml. refillable bottles may also fail the existing "tipping" test.

At the time this report has been prepared, the 1.5 litre "narrow" neck refillable glass bottle has consistently failed the "tipping" test, and therefore, must be withdrawn from the Canadian market in its present form. Federal testing is proceeding with respect to the "wide" neck 1.5 litre refillable bottle. It is not known whether this second design will, or will not, meet the "tipping test" tolerances.

The OSDA submission makes the point that the two-litre PET non-refillable bottle would meet the safety requirements in the new Federal Regulation; would be an "environmentally sound" container; would bring a "new technology" to Ontario and would create about 100 new skilled jobs in the plastics container industry in Ontario.

Ontario's existing carbonated soft drink packaging programme critically depends upon the availability of refillable containers in each allowed retail size. The mandatory availability and shelf space requirements are directly keyed to the existence of "acceptable" refillable containers. The voluntary industry restraint programme is defined by the market share of gallonage sales in refillables to be reached by the end of 1979.

With the OSDA proposal as one factor, and concomitantly, the health-hazard problem of refillable glass bottles as a second factor, Ontario's total environmental programme for carbonated soft drink packaging should come under review with respect to the OSDA submission.

This report takes a broad environmental perspective of carbonated soft drink packaging with emphasis on the 1.5 litre container market.

With the advent of the 1.5 litre health-hazard problem, Doctor Parrott has made three programme modifications on a temporary basis.* A September review of these temporary adjustments has been promised.

1.2 Review of Ontario's Programme for Carbonated Soft Drink Packaging

The objective of Ontario's programme was to "minimize" the adverse environmental impacts associated with carbonated soft drink packaging. The environmental impact variables were defined as post-consumer solid waste, energy, non-renewable raw materials, litter and air and water effluents.

The means of obtaining environmental benefits from carbonated soft drink packaging were the increased use and reuse of refillable carbonated soft drink containers.

The Ontario initiatives were started in 1975. A key element in the Ontario programme has been the mandatory availability requirement for carbonated soft drinks in refillable bottles. A second key element has been the voluntary restraint agreement offered by industry, under which the market share of containerized gallonage sales in refillable bottles would reach 75 per cent by the end of 1979.

Between 1976 and 1978, containerized gallonage sales in refillable glass bottles for the retail food sector had increased from 40% to 66.7%; the market share for non-refillable glass bottles fell in the same period from 23.8% to 2.0%, and the can share fell from 36.2% to 31.3%.

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* These are:
(a) Temporary relaxation of the equal shelf space requirement for refillables;
(b) Temporary permission for the sale of 1 litre containers;
(c) Lifting of the 1980 deadline in the voluntary industry agreement to achieve 75% gallonage sales in refillables.

Reported consumer return rates in Ontario for refillables have exceeded 90%, and in the 1.5 litre size have been reported at 97%. At these consumer return rates, the associated trippage levels for refillable glass bottles exceed the breakeven trippage levels. This is the condition required for achieving environmental gains in post-consumer solid waste, energy and non-renewable resources when refillables substitute for non-refillable containers.

In summary, since the Ontario initiatives were introduced:

a) sales in refillable containers have increased significantly (particularly in the family-size market);

b) reuse rates have been sustained at very high levels (particularly for family sizes);

c) important environmental gains in post-consumer solid waste, container energy and non-renewable raw materials have been obtained (particularly in the family-size market).

1.3 The PET Two-Litre Non-Refillable Bottle for Carbonated Soft Drinks

The following are the principal factors relating to the two-litre PET bottle for carbonated soft drink packaging:

a) The PET bottle has approval from the U.S. Federal Drug Administration (i.e., it is not carcinogenic and migration is not a problem).

b) The PET bottle cannot be made into a refillable bottle.

c) The PET bottle is permitted to be recycled for non-food contact end-uses in the United States.

d) The interest in recycling the PET container was greatly increased with the new mandatory deposit-refund regulations in Michigan, which generated a substantial quantity of reclaimed PET containers. European markets are also reported to be available for the reclaimed PET resin.

e) The PET container's contaminants (the aluminum closure, labels, adhesives for the labels and the polyethylene base in the two-piece container unit) can be technically removed in the recycling process.

f) The PET container has been recently introduced on a limited basis in Alberta (Calgary and Edmonton), in Manitoba (Winnipeg) and in Quebec (Montreal). One national brand sells for $1.69 a unit when the bottles are filled in Canada and $1.89 a unit when filled bottles are imported. It is expected that when the Canadian PET container market expands, the resin would be imported from the United States, although there is a possibility it could be produced in Canada.

1.4 Plastic-Coated Glass Bottles

In the United States, Dupont had developed the "Surlyn" process which provided a plastic coating for non-refillable glass bottles. According to respondents, this process was not price competitive with the two-litre PET non-refillable.

In Japan, there are several reported processes for applying a plastic coating to refillable glass bottles. These plastic-coated refillable bottles are reported to be able to achieve relatively high trippage levels. Technical information on these containers was not available when this report was prepared.

1.5 Policy Recommendation on a National Mandatory Deposit-Refund System by the U.S. Resource Conservation Committee (RCC)

The RCC research programme indicated that there would be a reduction in beverage container litter, municipal solid waste and a significant reduction in the use of virgin raw materials and energy (at high return rates) if this policy initiative were adopted nationally for the United States for beer and carbonated soft drink packaging.

The Resource Conservation Committee took a divided position on this proposal: four members supported it; two members opposed it and two members were generally supportive but wanted to attain additional impact information from the new State initiatives (e.g., Michigan) before rendering a final decision.

1.6 Current Ontario Environmental Perspective

From a 1979 Ontario environmental perspective for carbonated soft drink packaging, any new policy initiatives should first work towards sustaining the environmental gains achieved, and then work towards obtaining additional environmental gains.

Both source-reduction and effective reclamation-recycling methods of waste management should be considered. The source-reduction method relates to the increased use and reuse of refillable containers. With respect to the environmental analysis of the two-litre PET non-refillable system, a mandatory deposit-refund system should be evaluated from an environmental perspective. This would constitute a reclamation-recycling initiative.

1.7 Primary Containers Defined

In the environmental analysis in this report, the following six primary containers were considered:

		Container Code	Size
A.	Refillable Containers:		
1.	Refillable glass bottle	GL(REF)	1.5L
2.	Refillable plastic-coated glass bottle	PLGL(REF) *	1.5L
3.	Refillable plastic bottle (acrylo-nitrile)	AN(REF)	2L
B.	Non-Refillable Containers:		
4.	Non-refillable glass bottle	GL(NR)	1.5L
5.	Non-refillable plastic-coated glass bottle	PLGL(NR) *	1.5L
6.	Non-refillable plastic bottle (PET)	PET(NR)	2L

1.8 Key Environmental Variables

Three key environmental variables have been used in this environmental analysis:

a) the volume of post-consumer solid waste (including a "void" element) for primary containers only;

b) the total systems container energy;

c) non-renewable raw materials (under a weighting system whereby a pound of resin is considered to be valued at twenty times the Ontario purchase price for a pound of mixed inputs for glass containers) for primary containers only.

1.9 Environmental Scenarios Defined

The following three environmental scenarios were analyzed:

a) Scenario I: Refillable containers against non-refillable containers when a deposit-refund system is not mandated for non-refillables.

b) Scenario II: Refillable containers against non-refillable containers when a deposit-refund system is mandated for non-refillables.

c) Scenario III: The PET(NR) System versus the other non-refillable systems.

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* Based upon possible container types in the United States only.

1.10 Environmental Findings

a) Scenario I: Without a mandatory deposit-refund system for non-refillable containers, the three refillable container systems would all be environmentally preferable to each non-refillable container system (including the PET(NR) system) at reported trippage levels.

b) Scenario II: With a mandatory deposit-refund system for non-refillable containers, the PET(NR) system would approximate the environmental merits of the GL(REF) system on the basis of post-consumer solid waste and container energy at approximately an 80 per cent return rate for the non-refillable PET(NR) and at reported trippage levels for the GL(REF).

c) Scenario III: When only the three non-refillable container systems were evaluated, the PET(NR) system would be significantly environmentally preferable (for post-consumer solid waste, container energy and non-renewable raw materials) to both the GL(NR) and the PLGL(NR) systems.
(Note: Ontario regulations currently allow the 1.5 litre non-refillable glass bottle under regulatory conditions, i.e., mandatory availability by brand.)

1.11 Elements for An Effective Deposit-Refund System For Non-Refillable Containers

An effective deposit-refund system for non-refillable containers depends upon the following factors:

a) the deposit-refund level;

b) the site for consumer returns (i.e., retail stores or depots);

c) the commercial market for reclaimed resources, and

d) the level of contamination.

In a deposit-refund system for non-refillable containers, it is important that returned non-refillable containers are actually recycled. Respondents have indicated that in Michigan there are some warehouses in which used PET containers are currently being stockpiled. If these reclaimed containers were not recycled, then the environmental advantages attributable to the deposit-refund system (except for litter reduction) would disappear.

If the PET(NR) container were admitted to the Ontario market, consideration should be given to the development of:

a) a comprehensive commercial redemption and recycling programme, and

b) a foregone deposit fund, with "dedicated" waste management uses for these funds.

1.12 Policy Options Identified

The following policy options, which are not mutually exclusive, are identified:

a) Investigate new acceptable refillable primary container types for Ontario.

b) Status Quo (i.e., no major permanent adjustments in Ontario's carbonated soft drink packaging programme).

c) Allow the PET(NR) into the Ontario market:

i) with conditions;

ii) without conditions.

The set of possible conditions includes:

i) a mandatory availability requirement,

ii) a mandatory deposit-refund,

iii) a mandatory comprehensive commercial recycling programme, and

iv) a mandatory foregone deposit fund with "dedicated" waste management uses.

d) Develop environmental criteria for the acceptance of non-refillable containers for the Ontario carbonated soft drink industry.

1.13 The OSDA submission indicated that 100 new skilled jobs would be created in Ontario's plastic container industry if the PET container were admitted to the Ontario market. In addition, however, there would be expected job losses in the glass container industry and for regional bottlers.

1.14 Some Key Questions

a) Can an acceptable plastic-coated refillable bottle be developed for the 1.5 litre and the 750 ml. sizes in Ontario?

b) Under a possible mandatory deposit-refund system for the PET(NR):

i) should consumers return the PET containers to retail stores or to special depots?

ii) should the system be extended to the single drink size for non-refillable containers?

iii) should a foregone-deposit fund for non-refillable containers be established?

c) Can an effective commercial recycling programme be established in Ontario for returned PET containers?

d) What long-run changes should be made (or may have to be made) in Ontario's carbonated soft drink packaging programme as a result of the existing (and pending) regulations by Consumer and Corporate Affairs Canada?

1.15 Final Comments

a) With the experienced environmental advantages associated with increased use and reuse of refillable glass bottles, there should be urgent attention allocated to determine whether "acceptable" refillable containers will be available for Ontario in the 1.5 litre and 750 ml. and 300 ml. sizes.

b) With a refillable container alternative, the most environmentally attractive profile occurs for the PET(NR) when there is:

i) a mandatory deposit-refund system for the PET(NR);

ii) consumer return rates for the PET(NR) approach (or exceed) 80%;

iii) a comprehensive commercial recycling programme is developed in Ontario.

c) Without a refillable container alternative, the PET(NR) is environmentally superior (and to a significant degree) to the 1.5 litre non-refillable glass bottle, which is now an allowable Ontario container.

d) In the design of the future carbonated soft drink container system for Ontario, and in the design of the Ontario regulations directed towards this system, it would be extremely helpful if, at least, three major interest groups (health, environment and private sector industry) worked in concert. In this way, a long run approach to Ontario carbonated soft drink packaging could be adopted which could satisfy the minimum needs of each set of interests.

SECTION 2

INTRODUCTION AND BACKGROUND

2.1 Ontario Soft Drink Association Submission

On July 19, 1979, the Ontario Soft Drink Association presented a submission to Doctor Parrott, the Ontario Minister of the Environment, entitled, The Two-Litre Plastic Bottle. The industry's request was for "approval to introduce the two-litre plastic (PET) non-refillable container" into the Ontario carbonated soft drink market. Acceptance of this request would require modifications in Ontario Regulation 998/75 to allow a plastic non-refillable container for carbonated soft drink packaging, and in Ontario Regulation 687/76 to permit the two-litre size.

The principal rationale for this submission was directly linked to the Federal Government's recent request that 1.5 litre "narrow necked" refillable carbonated soft drink bottles be withdrawn from the Canadian market because of health hazards, which had been addressed by Consumer and Corporate Affairs Canada.

The OSDA submission included a resource and environmental profile analysis which related to the two-litre PET (polyethylene terephthalate) container and to refillable and non-refillable glass bottles.

This environmental impact data had been prepared by Franklin Associates Ltd., Kansas, U.S.A. which had previously completed a comprehensive environmental analysis of the PET container (against competitive container types and sizes) for the U.S. Goodyear Tire and Rubber Company in 1978.

The OSDA submission made the following points in favour of the two-litre PET non-refillable container:

a) It would eliminate the existing "safety" problem;

b) since it is primarily a family-use container, it would not present a litter problem;

c) the introduction of this container would create new opportunities for skilled workers in Ontario (about 100 new jobs); would increase investment and would bring a "new high technology industry" into Ontario, and

d) the Association "believes the plastic (PET) bottle is environmentally sound." (1)

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(1) OSDA Submission.

One final industry perspective, which was not indicated in the OSDA submission, is meaningful. The sales value for the carbonated soft drink industry in 1977 for Ontario was reported at $228 million. About 60 per cent of Ontario containerized gallonage sales occur in 1.5 litre and 750 ml. refillable bottles. The 1.5 litre size, itself, represents just under 20 per cent of total Ontario containerized gallonage sales, although this size has only been available for a small number of years.

2.2 Involvement of Consumer and Corporate Affairs Canada

Federal Consumer and Corporate Affairs Minister, Allan Lawrence, formally requested industry to remove the 1.5 litre "narrow-neck" carbonated soft drink bottles in 1979, because "tests conducted by the department's Product Safety Laboratory conclude that when tipped over or dropped on a hard surface the bottles consistently explode, projecting glass and contents over large distances." (1)

In June 1979, Professor David Barham (Department of Chemcial Engineering and Applied Chemistry, University of Toronto) presented a copy of his study, A Report on the Explosive Failure of Filled 1.5 Litre Soft Drink Bottles (dated May 11, 1979) to Consumer and Corporate Affairs Canada. Professor Barham conducted a "tip" test for a limited sample of 1.5 litre bottles. The results indicated that most of the bottles tested exploded on the first "tip." Professor Barham's test results also indicated that a number of 750 ml. refillable glass bottles exploded on the first "tip."

The Federal Minister of Consumer and Corporate Affairs Canada also indicated that "there have been some fifty incidents of exploding 1.5 litre soft drink bottles reported to my department in the last several weeks." (2)

The problem reached the newspapers and became a relatively high profile issue during June and July 1979. After the Federal Government request for a voluntary industry withdrawal of all 1.5 litre "narrow necked" refillable bottles, pressure developed to ban these bottles. Reports indicated that some 1.5 litre "narrow necked" bottles were still being marketed, although many retail stores had removed them after the Minister's request.

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(1) Consumer and Corporate Affairs: Canada, News Release (NR-79-22), June 28, 1979.

(2) Statement by the Honourable Allan Lawrence.

On July 16, 1979, the following statement was included in a news release by the Consumers' Association of Canada:

> "On July 10, 1979, CAC urged the Minister of Consumer and Corporate Affairs, Allan Lawrence, to ban all 1.5 litre bottles." (1)

"On August 7, 1979, Federal Consumer and Corporate Affairs Minister, Allan Lawrence, today announced that a safety standard for 1.5 litre or larger carbonated soft drink bottles has been established under The Hazardous Products Act and is effective immediately.... The safety standard applying to 1.5 litre or larger carbonated soft drink bottles constitutes only the first step in providing protection from flying glass. Broader-based standards covering other pressurized glass containers are also being developed, and will eventually be made operative so that all such containers will have standardized safety tests." (2)

2.3 Report Terms of Reference

The terms of reference call for the consultant to evaluate the OSDA submission and to submit a report as quickly as possible to the Waste Management Advisory Board outlining the options for action.

This is not a research report. Within the time-frame allowed, the intention was to conduct a critical review of the existing information and analysis in conjunction with the OSDA proposal.

2.4 Perspective For The Report

With the advent of regulations under The Federal Hazardous Products Act, the future life of the existing refillable carbonated soft drink bottle types becomes uncertain in Canada.

Each major element in Ontario's programme for carbonated soft drink packaging depends upon the existence of an acceptable family-sized refillable container. The present set of events, therefore, indicates that the total Ontario programme must come under review when the OSDA proposal is examined.

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(1) CAC News Release, National Office, Ottawa, July 16, 1979.

(2) Consumer and Corporate Affairs: Canada, News Release (NR-79-28), August 7, 1979.

Given this overall perspective and the report terms of reference, this report will primarily address the following questions with respect to Ontario carbonated soft drink packaging systems:

1. The comparative environmental relationships between refillable and non-refillable container systems (including the PET container system) when:

    a) a mandatory deposit-refund system does not exist for non-refillable containers;

    b) a mandatory deposit-refund system does exist for non-refillable containers.

2. The comparative environmental relationships between different types of non-refillable container systems (including the PET container system).

2.5 Refillable Versus Returnable Concepts

Refillable and returnable are terms which are often used interchangeably. However, in this report, these two terms have significantly different meanings.

A refillable container means one which can be returned for a deposit refund and then is capable of being refilled. A returnable container means one which can be returned by the consumer for a deposit-refund but it may, or may not, be capable of being refilled.

In this context, a refillable glass bottle is both returnable and refillable.

If a deposit-refund system were introduced, then bi-metallic cans and non-refillable bottles would be returnable but not refillable.

In this report, when containers can be refilled, they will be called refillable containers. A throwaway container will be called a non-refillable container and, if it were to bear a deposit-refund, it could also be called a returnable container.

2.6 Non-environmental Non-health Variables

In most beverage container studies, important attention has also been focused on the impacts on the non-environmental (and non-health) variables (i.e., on employment, investment, profits, consumer cost, choice and convenience and government revenue, etc.).

When beverage container initiatives are introduced by governments, they are usually intended to cause container substitution and/or changes in the container delivery-retrieval system, itself. As a consequence, these

initiatives (whether advocated for health or for environmental improvements) will impact upon employment, investment, profits, consumer price and convenience.

For example, in the present situation, one large industry concern relates to the life of the existing float of family-sized refillable glass bottles in Canada. If these refillable bottles were deemed obsolete under the new Federal regulations, then the Canadian carbonated soft drink industry would face a very sizeable loss, unless these containers could be satisfactorily modified or could be used in markets in other countries.

Although these non-environmental non-health variables are recognized as important, they are not evaluated in this report which was intended to provide an environmental perspective.

2.7 Acknowledgments

In the course of this short investigation, there were over twenty individual contacts made with corporate and government officials in Canada and in the United States. In each case, the respondent was extremely helpful in providing reports, data, information and professional opinions. These contributions are gratefully acknowledged.

To a large degree, this report is based upon this amalgam of input, in addition to the substantive input developed by Franklin Associates Ltd. which was included in the OSDA submission.

SECTION 3

REVIEW OF ONTARIO'S PROGRAMME FOR CARBONATED SOFT DRINK PACKAGING

3.1 Introduction

The Ontario Government's interest in the environmental aspects of beverage packaging officially started with the establishment in 1970 of the Littering Control Council of Ontario. It was significantly extended by the substantive three volume report of the Solid Waste Task Force to the Ontario Minister of the Environment in 1974. Of particular importance was the environmental analysis undertaken for, and the deliberations by, the Beverage Packaging Working Group of the Task Force.

Since its inception in early 1975, the Waste Management Advisory Board has carried on this work at the request of the Minister. The Board has presented two official reports to the Ontario Minister on the carbonated soft drink packaging programme. (1)

3.2 Ontario Environmental Goal Statement

According to the Advisory Board Report, the environmental goal statement reads:

> "To minimize the waste and adverse environmental impacts associated with the packaging of carbonated soft drinks." (2)

The report continues:

> "These adverse environmental impacts stem from the production, distribution and use of both primary containers and secondary packaging. They include:
>
> 1. generation of (post-consumer) solid waste;
> 2. consumption of energy and other non-renewable resources;
> 3. litter;
> 4. land, air and water pollution resulting from manufacture, distribution and disposal." (3)

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(1) Waste Management Advisory Board:

a) The Carbonated Soft Drink Container in Ontario, March 1976;

b) Evaluation of Ontario Regulation 687/76, December 1976.

(2) WMAB, The Carbonated Soft Drink Container in Ontario, op. cit., page 24.

(3) Ibid.

3.3 Means of Goal Achievement

Two integrated means of goal achievement were identified:

1. "The maximization of the use of refillable containers" (1) (i.e., the substitution of refillable containers for non-refillable containers).

2. "The increase of reuse rates (trippages) for refillable containers." (2)

The associated environmental analysis disclosed that if a refillable container system were to exceed specified trippage levels (when compared to a non-refillable container system), then the refillable system would be environmentally preferable. These critical trippage levels are called break-even trippage levels (BET levels).

3.4 Outline of Ontario Policy Initiatives

Ontario's policy initiatives on carbonated soft drink packaging, which commenced in 1975, are essentially described in Regulation 687/76 (which now contains several revisions) and Regulation 998/75. (3)

3.4.1 Key Elements of Regulation 687/76 (as revised)

a) Mandatory retail store availability of carbonated soft drinks in refillable containers in each allowed retail size. (Flavour availability is required in the 300 ml. size, and brand and flavour availability in each of the 750 ml. and 1.5 litre sizes);

b) Shelf display requirements for refillable bottles in each retail size whereby refillables must at least have equal display space (in concert with the mandatory availability requirements of 'a');

c) Allowable retail sizes are defined as: 300 ml., 750 ml. and 1.5 litres, and

d) A requirement that each retailer, who sells a particular brand, flavour and size of carbonated soft drinks, must offer a cash refund (at least equal to minimum levels for each container size) for clean returned refillable bottles for the identical brands, flavours and sizes sold.

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(1) Ibid.

(2) Ibid.

(3) The policy also includes acceptance of a voluntary industry restraint programme which is outlined in 3.4.3.

The mandatory availability requirement is an important and unique Ontario policy initiative which is intended to guarantee that consumers will be able to select most carbonated soft drinks in refillable containers. At this time, the refillable glass bottle is the only primary refillable container in the Ontario carbonated soft drink market. The mandatory availability concept has been adopted subsequently in New Brunswick and Nova Scotia. Unfortunately, mandatory availability has often been incorrectly described as a "matching" requirement. If a retailer only wishes to offer carbonated soft drinks in refillable bottles, the regulations allow it: there is no requirement that a brand or flavour must also be offered in a non-refillable container.

3.4.2 Regulation 998/75

The impact of this Regulation is to ban (effective January 1, 1976) the following non-refillable containers for carbonated soft drinks in Ontario:

a) non-refillable glass bottles, larger than 1.5 litres;

b) non-refillable aluminum cans;

c) non-refillable plastic bottles.

Although these container types and sizes were marketed (or about to be marketed) in the United States, they were not yet available in Ontario at the time of this Regulation. The Ontario policy programme was intended to increase the use and the reuse of refillable containers. The admission of new non-refillable containers would not be consistent with this policy approach.

However, it was suggested that future consideration could be given to new container types and container sizes and that a favourable environmental assessment would be required before the existing "banned" containers might be acceptable for the Ontario market.

It should be emphasized that both regulations (i.e., 687/76 and 998/75) do not "ban" new types of refillable primary containers in the allowable retail sizes. Industry container development towards a new type of refillable container has always been possible for Ontario.

The regulations do allow the marketing of non-refillable bi-metallic cans and of non-refillable glass bottles of the allowed retail sizes.

3.4.3 Voluntary Industry Programme of Self-Restraint (75/25 Market Share)

In his March 10, 1978 statement, Mr. George McCague, Ontario Minister of the Environment, stated that he had accepted "a voluntary program of self-restraint proposed by the (soft drink) industry. Its representatives have committed themselves to restricting the use of non-refillables to a maximum of 25 per cent of gross gallonage sales by December 31, 1979." (1)

This commitment also constitutes one of the key elements in the overall Ontario programme for carbonated soft drink packaging.

3.5 Temporary Modification of Regulations

On June 29, 1979, Ontario Environment Minister, Harry C. Parrott, "announced temporary measures which are intended to ensure adequate and safe supplies of soft drinks to Ontario consumers this summer." (2)

The Regulation requiring an equal display of refillables versus non-refillables was "relaxed" and the one litre container size (in refillable and non-refillable bottles) was permitted under these temporary measures. In addition, the voluntary industry agreement of a 75/25 per cent ratio (refillables to non-refillables) by December 31, 1979 was temporarily lifted. (3)

The Minister also stated in this news release that: "I am most reluctant to initiate any change in our current regulations that will permanently impact on the progress the industry has made in Ontario toward increased use of the refillable container." (4)

Doctor Parrott indicated that "the matter will be reviewed at the end of September." (5)

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(1) The Honourable George R. McCague, Statement to the Legislature on Carbonated Soft Drinks, March 10, 1978.

(2) Ontario Ministry of the Environment News Release, June 29, 1979.

(3) Ibid.

(4) Ibid.

(5) Ibid.

3.6 Other Aspects of Ontario's Programme

The following points are germane with respect to the Ontario programme development for carbonated soft drink packaging:

a) goals and objectives were defined by the Government well in advance, which allowed a reasonable industry transformation period;

b) industry was initially given an opportunity to voluntarily conform to the principal regulations;

c) there has been a continual dialogue between government and industry on these issues.

SECTION 4

SUMMARY OF THE RESULTS OF THE ONTARIO PROGRAMME

4.1 Introduction

Environmental benefits would accrue in post-consumer solid waste, container energy, non-renewable resource use and litter when an increased share of the containerized gallonage sales were in refillable containers, and when satisfactory trippage levels were attained.

4.2 Market Share Response to Ontario Initiatives (By Container Type)

MARKET SHARE TRANSFORMATION

CONTAINER TYPE	PERCENTAGE SHARE OF GALLONAGE SALES (1)	
	1976 (YEAR AVERAGE)	1978
REFILLABLE BOTTLES	40.0%	66.7%
NON-REFILLABLE BOTTLES	23.8	2.0
CANS	36.2	31.3
	100.0%	100.0%

Containerized gallonage sales in refillable bottles in Ontario have increased from 40% in 1976 to 66.7% in 1978 (plus 26.7 perentage points). The market share for non-refillable bottles fell from 23.8% in 1976 to 2.0% in 1978 (minus 21.8 percentage points) and, finally, gallonage sales in cans fell from 36.2% in 1976 to 31.3% in 1978 (minus 4.9 percentage points).

Graph 4.1 indicates the U-shaped pattern for the market share of refillable bottles. The refillable market share started to rise at about the same time the Ontario initiatives were initially stated in Mr. William G. Newman's March 1975 speech to the industry. In that speech, as Minister of the Environment, he requested that industry voluntarily increase the sale of refillable bottles and voluntarily introduce mandatory availability of refillable bottles in retail stores by brand, flavour and size. (2)

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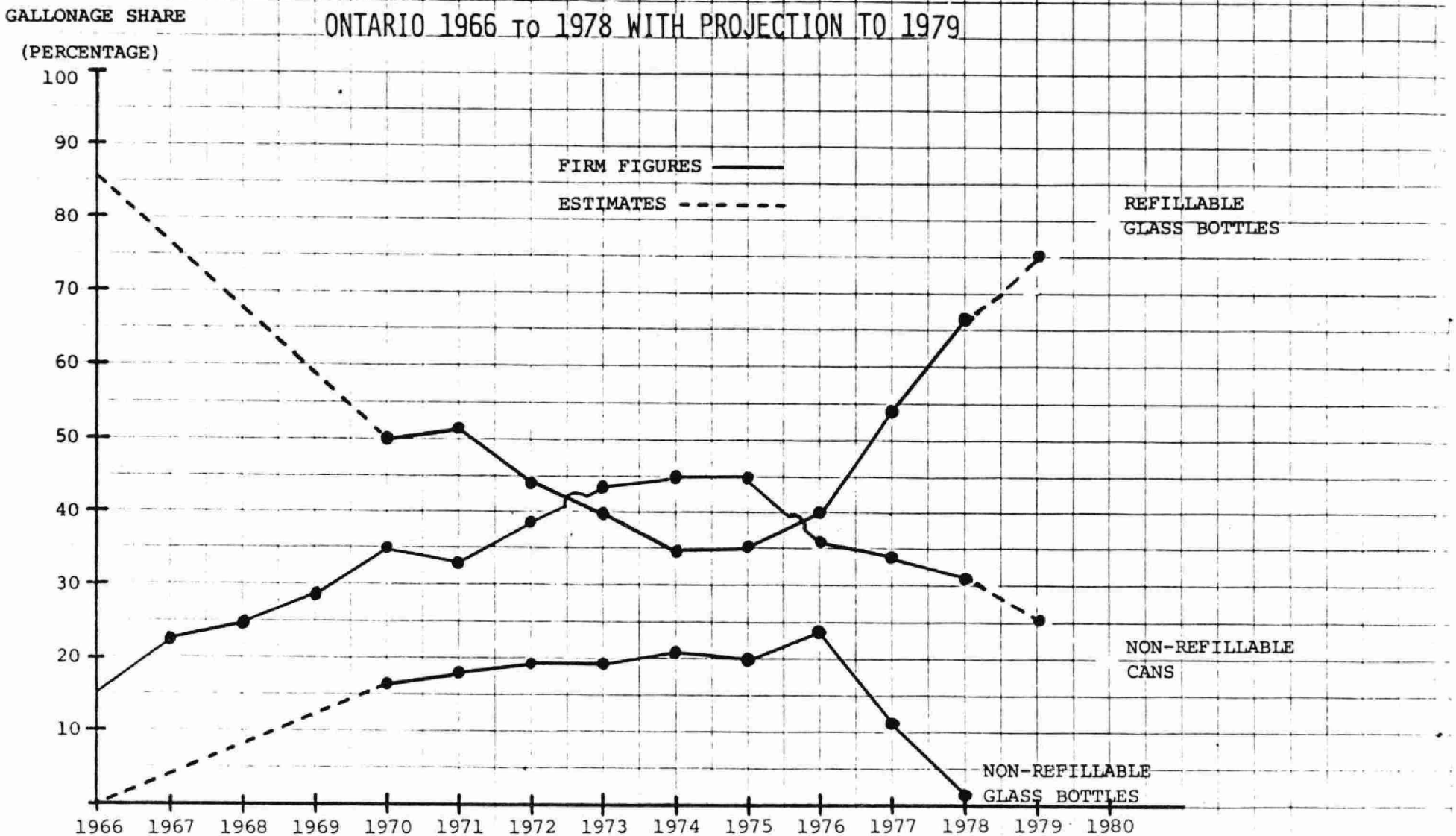
(1) For retail food store sales in Ontario.

(2) The Honourable William G. Newman, Ontario Minister of the Environment, Statement to Representatives of the Carbonated Soft Drink Beverage Industry, March 13, 1975.

GRAPH 4-1

GALLONAGE SALES BY CONTAINER TYPES

ONTARIO 1966 TO 1978 WITH PROJECTION TO 1979



Graph 4.1 also indicates that the market share for cans had reached about a 45% level during the 1973 to 1975 period.

In the graph, the dashed lines indicate the projections to the end of 1979 if the 75/25 ratio of gallonage sales were to be reached according to the voluntary industry agreement.

In summary, between 1976 and 1978, there has been a very sizable increase in the share of containerized gallonage sales in refillable bottles in Ontario. Since the 1978 market share for non-refillable bottles was negligible, the remaining market share shift, promised under the voluntary industry programme, would almost all have to be gained at the expense of the market share for the single drink can.

As indicated in Section 3.5, the Government has temporarily "relaxed" the 75-25 market mix, which had been promised under the voluntary industry restraint programme by December 31, 1979.

4.3 Break-Even Trippage Levels, Trippage and Environmental Gains

The break-even trippage level (i.e., BET level) is a technical co-efficient which is applicable to each environmental variable except litter. (1) The co-efficient specifies the number of trips which a refillable bottle must experience before the refillable bottle system generates the same environmental impact as a specified non-refillable system (i.e., the same level of post-consumer solid waste or container energy). When experienced trippage levels exceed the BET level for a specified environmental variable, then environmental benefits would be achieved.

Trippage (T) is directly related to the average propensity of consumers to return refillables for deposit refund (APRR) as follows:

$$T = \frac{1}{(1 - APRR)} \quad (2)$$

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(1) Litter is a function of container sales, the container size, the container type and the container system, including whether or not the non-refillable container bears a consumer deposit-refund.

(2) Appendix 'A' includes more analysis on the trippage concept.

The computed break-even trippage levels for post-consumer solid waste, container energy and non-renewable resources, developed for earlier Ontario analyses, are indicated below:

	SINGLE DRINK SIZE (REFILLABLE GLASS BOTTLES VERSUS BI-METALLIC CANS)	FAMILY SIZES (REFILLABLE GLASS BOTTLES VERSUS NON-REFILLABLE GLASS BOTTLES)
	BET LEVELS	
VOLUME OF POST-CONSUMER SOLID WASTE	3.5	1.0
CONTAINER ENERGY (TOTAL SYSTEM)	3.2	1.7
NON-RENEWABLE RESOURCES (WEIGHT OF POST-CONSUMER SOLID WASTE)	8.4	1.5

On the basis of this earlier analysis, the refillable glass bottle system would be environmentally preferable:

a) to the bi-metallic can in the single drink size at nine trips, and

b) to the non-refillable family size glass bottle at only two trips

when all three environmental variables are included. Some environmental gains are achievable for the refillable container system at lower trippage levels.

4.4 Ontario Trippage Experience

According to a 1978 report on the distribution and handling costs related to refillable carbonated soft drink bottles, the average propensity to return refillable bottles in Ontario was reported as follows: (1)

a) 1.5 litre refillables: 97%
b) 750 ml. refillables: 96%
c) 300 ml. refillables: 93%

The following table indicates the trippage level without (and with) a 2% allowance for in-plant rejections. (2)

REFILLABLE CONTAINER SIZE	TRIPPAGE (T)	TRIPPAGE (T*) (3) (ADJUSTED FOR IN-PLANT REJECTION OF 2%)
1.5 LITRE	33 1/3	20
750 ML.	25	16 2/3
300 ML.	14.3	11.1

(1) Peat Marwick and Partners, The Distribution and Handling of Returnable Soft Drink Bottles, for the Ontario Soft Drink Association, October 1978, (and supplied through the courtesy of the OSDA), page VI - 3.

(2) The Peat Marwick Report used a 3% in-plant rejection rate which they considered a "conservative assumption." Ibid.

(3)

$$T^* = \frac{1}{1 - (APRR - IPR)}$$

where IPR stands for the in-plant rejecton rate. See Appendix 'A' for further analysis on trippage.

4.5 Ontario Initiatives And Environmental Gains

Sales in refillable glass bottles have substantially increased since 1975, when the Ontario environmental programme was initiated. Experienced trippage levels in the family sizes of refillables and in the single-drink size are both higher than the necessary break-even trippage levels.

On this basis, significant environmental gains in post-consumer solid waste, container energy and non-renewable raw materials have been made in Ontario. Since non-refillable containers (without a deposit-refund) are littered at higher rates than refillable containers, fewer carbonated soft drink containers would be expected in the Ontario litter stream.

Most of the environmental gains for post-consumer solid waste, container energy and non-renewable raw materials would have been made in the family sizes. This is because of the low BET levels, when refillable glass bottles substitute for non-refillable glass bottles, combined with the extremely high consumer return rates reported for the family-sized refillables.

SECTION 5

ACTIONS BY CONSUMER AND CORPORATE AFFAIRS: CANADA

5.1 Introduction

The container health hazards related to the 1.5 litre refillable glass bottle were identified in Section 2. (1) The problem relates to the failure of many 1.5 litre refillable bottles in the "tipping test". When a container fails, glass fragments are sent with some force for considerable distances. Fragment containment is the present prime issue when bottles break.

5.2 Regulations on 1.5 litre Glass Bottles

The regulations by Consumer and Corporate Affairs Canada, under the Hazardous Products Act, require that 1.5 litre glass carbonated soft drink bottles pass the designated "tipping" test. In essence, the filled glass bottles will fail should they break upon tipping. Failure means that glass fragments would penetrate the surrounding aluminum foil used during the test. If a glass bottle did not break on the first "tip", it would be turned 180° and "tipped" a second time. If it again failed to break, it would have passed the "tipping" test.

5.3 "Tipping" Results: 1.5 litre Refillable Bottles

In the 1.5 litre size, there are essentially two container designs: a "narrow" neck glass refillable bottle used by most bottlers, and a "wide" neck glass refillable bottle developed by Coca-Cola Ltd. and used for Coca-Cola, Sprite and Schweppes products.

According to the results of the Product Safety Laboratory of Consumer and Corporate Affairs and from the opinion of industry representatives:

a) the "narrow" neck bottle has an almost 100% failure record,

b) the "wide" neck bottle has a failure rate that has been reported between 2% and 10%.

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(1) More details are contained in Appendix B.

At the time this report is being written, Federal inspectors are conducting tests at several Coca-Cola bottling plants in order to determine the failure rate for the 1.5 litre "wide" neck bottles from a more comprehensive sample.

It is understood that a "tolerance level" of failures is being considered, and that this level might be at a 3% failure rate. Bottle designs of the 1.5 litre size which had a lower or an equal failure rate would then be allowed on the Canadian market.

It, therefore, seems definite that the 1.5 litre "narrow" neck refillable bottles would fail the "tipping" test, and that the 1.5 litre "wide" neck refillable bottles could fail the "tipping" test. In Ontario, about 20 per cent of containerized gallonage sales has been in the 1.5 litre refillable bottle size.

Trippage is thought to be one factor which could account for the increase in accidents related to 1.5 litre refillable bottles.

5.4 The "Tipping Test" and Smaller Sized Refillable Bottles

Further, there is uncertainty over the 750 ml. refillable bottle designs. According to the news releases from Consumer and Corporate Affairs, when the 1.5 litre size has been satisfactorily tested, the "tipping" test would be extended to other "pressurized glass containers", which would include 750 ml. and 300 ml. glass refillable bottles. About 40 per cent of Ontario containerized gallonage sales occurs in 750 ml. refillable bottles.

The existing regulations do not cover these smaller sizes of refillables. Also, there would appear to be a lower incidence of injuries reported for 750 ml. and 300 ml. glass refillable bottles according to the Department's June 14, 1979 accident report.

However, uncertainty does exist on whether these refillable bottles (750 ml. and 300 ml.) would be satisfactory containers as defined in the Regulations introduced by Consumer and Corporate Affairs Canada.

5.5 Suggested Means to Achieve Testing Success

There are two reasons for failure in the "tipping" test:

a) the glass containers break, and

b) the broken glass containers yield fast-flying glass fragments.

The suggested container modifications include:

a) adjustments to the existing container design,

b) plastic coating outside glass bottles, and

c) adding a plastic or rubber collar to the bottle.

The plastic coating would be expected to both reduce the probability of breakage, and to contain the glass fragments of the bottle wire to break. The collar would be expected to reduce the chance of the bottle breaking, but if it did break, there still could be a spray of glass particles. Both the plastic-coating and the collar would be expected to be sufficient to allow 1.5 litre refillable bottles to pass the existing safety test and, therefore, remain in the Canadian market. The collar would also allow the existing industry float of refillable bottles to be utilized.

5.6 Possibilities of Additional Safety Tests

The officials at Consumer and Corporate Affairs are also contemplating the development of other tests for pressurized containers, including the possibility of a "drop" test. Additional safety tests would add to the uncertainty of the types and sizes of refillable glass containers that would be acceptable to the Department.

5.7 Non-Health Hazard Variables

The environmental advantages of a highly refillable delivery system for carbonated soft drink containers, when consumer return rates are very high, have already been addressed.

The carbonated soft drink industry is confronted with the possible withdrawal of its dominant container type in Ontario. At the very least, some modifications would seem to be mandatory.

The Consumer and Corporate Affairs' regulations refer solely to the health hazards associated with the refillable glass bottles. Important non-health hazard variables do not yet seem included in the decision-making matrix.

SECTION 6

ALL PLASTIC BOTTLES

FOR CARBONATED SOFT DRINKS

6.1 Plastic Containers for Carbonated Soft Drinks

Two types of resin have satisfactory barrier properties to contain carbonated soft drinks:

a) acrylo nitrile (AN), and

b) polyethylene terephthalate (PET).

6.2 U.S. F.D.A. Approval: [1][2] Plastic Containers

The U.S Federal Drug Administration is concerned about container migration, and about the carcinogenic (cancer-causing) properties of plastic containers, as well as other toxicity problems.

When the migration levels are below a defined tolerance level, then the migration is not considered to be a food additive and the U.S. F.D.A. does not regulate the packaging material. However, if the packaging material is carcinogenic and any level of migration can be detected, then the packaging material is likely to be restricted to non-food contact uses.

6.3 U.S. F.D.A. and AN Beverage Containers

The acrylo nitrile 32 oz. non-refillable bottle was introduced into the American market by Coca-Cola Ltd. After its introduction, the U.S. F.D.A. has required that it be withdrawn pending further testing because of concern over possible carcinogenic properties which had been reported in tests with rats which had ingested concentrated strengths of the AN resin. There is an industry law suit on this issue and a court decision is expected possibly within the next year.

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(1) The U.S. F.D.A. position on plastic containers for food use application and specifically for the PET resin was obtained in a telephone conversation with Dr. Robert Livingstone, a senior official of the U.S. F.D.A.

(2) The U.S. E.P.A. does not approve (or disapprove) of any specific beverage container. The OSDA Submission indicated that the PET container had E.P.A. approval, which is incorrect.

6.4 U.S. F.D.A. and PET Beverage Containers

The PET resin has been approved for food packaging applications (e.g. Mylar film for cheese wrap) many years ago. When the plastics industry was interested in marketing the 2-litre PET non-refillable container in the carbonated soft drink industry, it provided the U.S. F.D.A. with additional information which supported the previous data and "did not cause any concern". The evaluation indicated migration levels for the PET container were "well below" the tolerance levels, and therefore, there was no "food-additive" condition. The PET resin is not carcinogenic.

Therefore, the U.S. F.D.A. has given an unrestricted approval for the PET 2-litre non-refillable plastic bottle for the carbonated soft drink industry, as a one-use container.

This situation will be reviewed within five to ten years during the normal F.D.A. cyclical review procedures.

6.5 U.S. F.D.A. and Recycled Plastics

The U.S. F.D.A. has an old regulation which generally forbids the use of recycled plastics for food contact use. Essentially, only industrial in-plant trimmings may be recycled for food contact use and there is a percentage allowance in these cases.

There is no specific F.D.A. assessment of the recycled PET resin from used soft drink bottles. It would presently fall under the preceding regulation. The industry would be able to request approval for post-consumer recycling of the PET bottle into new PET bottles for soft drinks if it wished.

6.6 Health and Welfare Canada and the PET Bottle[1]

The Additives and Pesticides Division of Health and Welfare Canada is currently investigating the safety of the 2-litre PET bottle in Canada. This Department's concerns are the level of migration and toxicity. Each case is evaluated on its own merits: there are no standard tolerance levels used in Canada.

Although the PET container evaluation has not been completed, based on previous evaluations of the PET resin for other food contact uses, it would be anticipated that a favourable evaluation will be forthcoming.

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(1) Telephone conversation with Mr. Bob Ripley, Additives and Pesticides Section, Health and Welfare Canada.

6.7 Marketing PET Soft Drink Containers in the United States

6.7.1 Bottle Designs for Carbonated Soft Drinks

There are two types of 2-litre PET non-refillable plastic containers (made of polyester) in the United States: Continental's one piece proprietary design called "petalite", and a PET bottle with a separate base (polyethylene) which is glued to the bottle. Continental's product is estimated to have about 30% of the 2-litre market in the United States.

Both types of 2-litre PET bottles are marketed in most urban regions in the United States, including those States which have a mandatory deposit-refund system for non-refillable carbonated soft drink containers (e.g., Michigan, Oregon, Vermont). In Oregon, the 2-litre PET non-refillable bottle has reportedly replaced large sized refillable glass bottles in the marketplace.

A 1-litre size is also used in some markets, although Continental does not produce the 1-litre size at this time. Unit production costs in the 1-litre size are relatively high, and some respondents believe that CO_2 containment may also be a problem in this smaller size.

All major brands and flavours are being marketed in the PET bottle, although one bottler expressed concern that for some flavours, migration could occur from the soft drink into the container if the product were not consumed relatively quickly.

6.7.2. PET: A Non-Refillable Bottle

The 2-litre and 1-litre PET bottles for carbonated soft drink bottles are non-refillable containers. Several respondents supported the opinion that, in its present form, the PET bottle could not be made into a refillable bottle. This issue may not have been addressed seriously: most large sized containers in the United States are sold in non-refillable bottles (1) and the PET bottle can be recycled.

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(1) In 1977, about 26% of total gallonage sales was estimated in non-refillable bottles in the United States; about 38% is in refillable bottles and about 36% in bimetallic and aluminum cans. (Source: U.S. Resource Conservation Committee, Second Report to the President and Congress of the United States 1978, page 29).

The respondents indicated the following problems in using the PET 2-litre container as a refillable:

a) in the washing cycle, the heat level used and the caustic solution could cause structural damage to the container and bottle shrinkage;

b) the PET container is less impervious than the AN container and contaminants like gasoline could migrate into the container. (Hydro carbon snifters would be needed to detect this problem).

6.8 Marketing PET Two-Litre Bottles in Canada

Two litre PET non-refillable bottles for carbonated soft drinks have been recently marketed in Alberta (Edmonton and Calgary, where several bottlers have, or are about to, introduce this container), in Manitoba (Winnipeg) and in Quebec (Montreal).

The PET bottles are presently imported into Canada, and in the Quebec case, the bottles have been filled in the United States.

The present marketing price for one national brand is $1.69 per unit (when bottled in Canada) and $1.89 per unit (when the filled bottle is imported).(1) It has been reported that the 2-litre PET bottle costs in excess of forty cents and, the cost is higher if it is imported.

It is expected that as the Canadian market develops for the PET container (only Ontario is known to have a ban on its introduction), the resin would be imported. However, one respondent indicated that a Canadian manufacturer might be willing to produce the resin in Canada. The PET resin is reported to currently sell for over fifty cents a pound in the United States.

6.9 The PET Container and U.S. Recycling

6.9.1. Recycling Status

With the advent of the Michigan mandatory deposit-refund system, which became effective in December, 1978, PET containers are being returned by consumers for deposit-refund at a 10 cent deposit level. The estimated consumer return rate may be about 80% in some urban areas of Michigan but less in rural areas, although no firm information is available. With the increasing costs expected for petroleum and with the new availability of a steady supply of reclaimed PET containers, there is an industry interest in recycling the PET bottles.

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(1) The U.S. retail price is reported to be about $1.29 for major brands, although this is reduced when "specials" are offered.

Dupont is offering Michigan bottlers a price for ground PET bottles and expects to establish a profitable recycling operation on a commercial scale in North Carolina within the next few months. One respondent indicated that an estimate of the minimum annual quantity for a commercial recycling plant for the PET resin would be reclaimed material of the order of 10 million pounds annually.

Other major chemical companies (e.g., Goodyear) and several smaller companies are also involved in recycling the PET resin.

It has been reported that the American chemical industry has made no significant effort to reclaim PET containers in States where a deposit-refund mechanism is not established.(1)

6.9.2. PET Container Recycling and Contaminants

The following are the reported contaminants in the process of recycling PET polyester bottles:

a) base for the two-piece bottle only (polyethylene),

b) adhesives for the label and base (where applicable),

c) resin colour (PET bottles are clear and a small proportion have a green tint),

d) aluminum closures,

e) label (paper and plastic).

Additional serious contamination could occur if other types of plastic containers were ground with the PET container. This is one factor which suggests that grinding equipment should not be located at retail stores, where other packaging could be unintentionally added to the grinder.

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(1) Respondents indicated that a BIRP programme (beverage industry recycling programme) had been successfully established in Arizona. In this programme, aluminum and plastic containers are redeemed at relatively low prices from consumers and sold to recycling companies. (Consumers may receive about a penny a pound for PET containers.) It is reported that price per pound for reclaimed aluminum containers may be in the order of three to four times the price per pound for reclaimed PET bottles.

6.9.3 PET Container Return System: Michigan and Oregon

In both Michigan and Oregon, consumers claim their deposit refund from retailers with a refund level of 10 cents in Michigan and 5 cents in Oregon. Comprehensive information on consumer return rates is not available in either jurisdiction. Informed opinions indicate that the consumer return rate in Oregon may be about 80% and somewhat less in Michigan.

In Oregon, a local recycling company is handling most returned beverage packaging (plastics, aluminum and corrugated). Retailers sometimes use locked external storage areas to avoid the "double" deposit risk. The returned PET bottles are bundled, returned to bottlers, and then received by the recycling company where they are cleaned and ground. The recycler has no difficulty in selling them to a plastics recycler.

In Michigan, many retailers place the returned PET bottles in large plastic bags which contain 40 to 45 PET bottles, and then they are returned to the bottlers. Some bottlers grind the PET containers into chips (about 5/8 of an inch in size) and sell them to a plastics recycler. In other cases, warehouses containing large numbers of whole PET containers have been observed in Michigan.

There are technical processes by which the principal contaminants can be removed. The degree of secondary processing will depend upon the anticipated end-use and the relative costs of each recycling process. The expected future price for virgin resin will also be a factor.

6.9.4 End-Use Products for Recycled PET Containers

Respondents indicate that the following end-use products can utilize the reclaimed PET resin:

a) carpet yarn,

b) fibre fill (sleeping bags, ski jackets, pillows),

c) strapping,

d) as a base in road construction for asphalt.

The Dupont respondent indicated that there are about 200 polyester items which use the virgin PET resin. Many of these could be considered potential end-use possibilities for the reclaimed PET resin. In some cases, very little contamination in the polyester could be permitted. Market development depends upon the profitability for each end-use; the degree of contamination of the polyester is one major factor.

6.10 Acrylo nitrile (AN) Refillable Plastic Bottles

Before the adverse U.S. F.D.A. ruling which caused the non-refillable acrylo nitrile bottle to be withdrawn from the American market, there were reports that a refillable AN plastic bottle was being developed. As reported earlier, the AN case is currently in the U.S. courts, and therefore, it is very difficult to obtain definitive information on AN containers.

Apparently, the AN container would be less subject to the difficulties reported for the PET containers as a refillable.

If AN were to be available for a refillable plastic bottle for carbonated soft drinks, then it would be likely produced in a 1-litre size (and not a 2-litre size) because of the properties of the AN resin.

From the information received, if there were to be a refillable all plastic bottle for the carbonated soft drink industry, it would be an AN bottle and not the PET bottle.

SECTION 7

PLASTIC COVERED GLASS BOTTLES

FOR CARBONATED SOFT DRINKS

7.1 United States Experience: Plastic Coated Non-Refillable Glass Bottles

The U.S. family-sized container market for carbonated soft drinks is largely a non-refillable container market.

Family sized non-refillable bottles in the United States are sometimes shielded with a plastic (styro foam) sleeve. If the bottle were to break, this plastic sleeve would not be expected to contain glass fragments.

Dupont has developed the "surlyn" process to coat non-refillable glass bottles. In addition to the benefits of the coating, the "surlyn" process would allow less glass to be used in each container. The "surlyn" process for non-refillable carbonated soft drink bottles is considered to be relatively expensive and reportedly these containers could not compete with the two-litre PET container. As a consequence, "surlyn" carbonated soft drink containers are not being marketed in the United States.

Apparently, the 2-litre PET bottle is successfully competing with family-sized non-refillable glass bottles and with family-sized refillable glass bottles.

No information was received about any development in the United States related to a plastic-covered refillable glass bottle.

7.2 Japanese Experience: Plastic Coated Refillable Glass Bottles

In the Japanese market, there are apparently three separate types of plastic coated refillable glass bottles for carbonated soft drinks. In one case, the coating is applied in two stages (rubber and then epoxy); in a second case a plastic coating is applied (the Kyowa method), and in the final case,

a plastic powder is applied. These plastic-coated refillable bottles have been marketed for between two and five years. Reports indicate that these plastic-coated refillable glass bottles could experience a large number of trips.

At the time this report was in preparation, technical details on these Japanese processes were not available. Therefore, these container types could not be included in the environmental analysis in this report.

It would be expected that these plastic covered refillable bottles would satisfy the existing "tipping" test. It is unknown whether these containers would satisfy additional federal tests, e.g., a "drop" test.

It is also not known whether these processes could be economically and technically applied to the existing float of family-sized refillable bottles in Canada.

Reports indicate that in some of these Japanese processes, the plastics can be removed for recycling processes.

SECTION 8

WORK OF THE U.S. RESOURCE CONSERVATION COMMITTEE ON A MANDATORY DEPOSIT SYSTEM

The U.S. Interagency Resource Conservation Committee provided the following environmental findings related to the adoption of a federal mandatory deposit-refund system for all carbonated soft drink and beer containers in the United States:(1)

a) provides an effective way to reduce beverage container litter,

b) would eliminate up to 2% of municipal solid waste,

c) would result in a "significant conservation of virgin material and energy resources at a return rate level of at least 85% to 90%".(2)

The Committee policy recommendation on this initiative indicated a divided verdict which follows:

"Four of the eight members taking a position on national beverage container deposit legislation recommend that it be adopted. Two members recommend against such legislation; two favor postponing consideration of national legislation until there has been more experience at the State level, and one member takes no position."(3)

In the light of this substantive environmental analysis by the R.C.C., an effective reclamation-recycling system has been deemed to be environmentally beneficial.

The expected return rates on non-refillable containers were forecast to be less than the expected return rates for refillable glass bottles in each scenario reviewed. However, the minimum deposit level was to be set at only five cents a container.

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(1) U.S. R.C.C. Choices For Conservation, Final Report, To the President and Congress of the United States, July, 1979, pages xvii to xx.

(2) Ibid., page xvii.

(3) Ibid., page xx.

SECTION 9

ENVIRONMENTAL ANALYSIS: GOALS AND MEANS

9.1 Goal Statment Reviewed

The environment goal is to reduce the adverse environmental impacts from carbonated soft drink packaging related to:

a) post-consumer solid waste,

b) container systems energy,

c) non-renewable (non-energy) resources,

d) litter,

e) air and water effluents and industrial solid waste.

These environmental variables are consistent with those identified with respect to the Waste Management Advisory Board's goal statement (Section 3.2) except that industrial solid waste has been explicitly identified, and to the Franklin analysis except that litter has been added.

9.2 Ontario Environmental Perspective

It was a finding in Section 4 that Ontario's carbonated soft drink packaging initiatives had generated significant environmental gains by the end of 1978.

From a 1979 Ontario environmental perspective, new policy initiatives should work towards sustaining the environmental gains achieved, and then work towards obtaining additional environmental gains.

Ontario's policy initiatives have caused a movement up the ladder towards strong environmental gains. However, the vehicle for attaining these environmental benefits, the refillable glass bottle system, has been shown to possess some health-hazard deficiencies.

9.3 Means to Goal Achievement

The previous means cited was the source-reduction method of waste management whereby there was to be increased use and reuse of refillable glass bottles.

With respect to the environmental analysis of the 2-litre PET non-refillable system, a mandatory deposit-refund system should be evaluated from an environmental perspective. This reclamation-recycling method of waste management is suggested by the Resource Conservation Committee's evaluation, and is additionally suggested by the form in which the Franklin data (attached to the OSDA Submission) was presented.

In summary, both source-reduction and reclamation-recycling methods of waste management should be reviewed from an environmental perspective, with respect to carbonated soft drink packaging. The mandatory deposit-refund system appears to be the only effective means of recovering and recycling two-litre used PET non-refillable carbonated soft drink containers.

SECTION 10

ENVIRONMENTAL COMPARISONS

10.1 Environmental Scenarios Defined

Scenario I

The refillable container system versus the non-refillable container system, when there is no mandatory deposit-refund system for non-refillable containers.

Scenario II

The refillable container system versus the non-refillable container system, when a mandatory deposit-refund system exists for non-refillable containers.

Scenario III

The PET non-refillable system versus the other non-refillable container systems.

The preceding scenarios indicate that it is container types associated with container systems and not container types themselves, which should be evaluated.

10.2 Introduction of Primary Containers

With respect to the input received relating to all plastic and plastic coated glass containers, three primary container structures are identified: namely; glass, plastic and plastic covered glass containers. In each of the three cases, a refillable and a non-refillable container type are specified.

The following table defines each of the six primary containers, their container size and their container code. The unit container weight is also specified. Earlier evidence indicated that the PET container cannot be a refillable. For this reason, an AN refillable has been offered in order that approximate comparisons could be made between a refillable and a non-refillable all plastic container.

Definition of Primary Containers

A. Refillable Primary Containers	Size	Unit Weight (oz.)	Code
1. Glass	1.5L	42*	GL(REF)
2. Plastic coated glass	1.5L	35½	PLGL(REF)
3. Plastic (acrylo nitrile)	2L	4½	AN(REF)
B. Non-Refillable Primary Containers			
4. Glass	1.5L	33*	GL(NR)
5. Plastic coated glass	1.5L	28	PLGL(NR)
6. PET (polyethylene terephthalate)	2L	3*	PET (NR)

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* In the Franklin-OSDA Submission, the assumed unit weights are: GL(REF) - 40 ounces, GL(NR) - 33 ounces, and PET(NR) - 3 ounces for the primary containers.

10.3 Secondary Packaging and Closures

Franklin (OSDA) assumes plastic reusable shells are used for both the GL(REF) and PET(NR) systems and corrugated cartons for the GL(NR) system.

This report does not include secondary packaging or closures in the environmental impact analysis except when the Franklin (OSDA) input is used.

All refillable systems can use plastic reusable shells. Although Franklin (OSDA) indicates the PET(NR) also uses plastic shells, information from respondents in the United States indicates that corrugated cartons are currently being used in most American markets.

The effect of not including secondary packaging is to present a small bias in favour of the non-refillable container system when the environmental analysis is undertaken. If corrugated one-trip cartons were used for the PET(NR), then the Franklin (OSDA) series would probably be marginally understated.

Aluminum closures used for each primary container are also excluded in the analysis in this report unless the Franklin (OSDA) input (in which they are included) is used.

10.4 Post-Consumer Solid Waste

Post-consumer solid waste is measured in the Franklin work according to its volume dimension. The volume of solid waste has two elements: the solid volume of the container material and the "void" element. (1)

The following are the specific gravities and "void" percentages used in this report. The bracketed items are the estimated "void" percentages used by Franklin.

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(1) The first environmental impact study to use the "void" factor was the Ontario Solid Waste Task Force Report of 1974.

Volume of Solid Waste Assumptions

		Specific Gravity	"Void" Percentage
A.	Refillable Containers		
1.	GL(REF)	2.8	80% (95%)*
2.	PLGL(REF)	2.8 & 1	90%
3.	AN(REF)	1	50%
B.	Non-Refillable Containers		
4.	GL(NR)	2.8	65% (<70%)*
5.	PLGL(NR)	2.8 & 1	90%
6.	PET(NR)	1	30% (50%)*

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* The estimated "void" percentages derived from the Franklin (OSDA) submission. The 50% void percentage for the PET container has been directly confirmed with Franklin Associates Ltd., and was determined by actual investigations undertaken by that firm.

The percentage of"void"for the PET(NR) container would depend upon:

a) the percentage of containers which had the base units attached in landfill, and

b) the percentage of containers which go to landfill with the closure attached.

10.5 Container Energy

All analysis on container energy refers to the Franklin (OSDA) input. It was not possible to receive more detailed information in time to review the total systems energy input.

10.6 Non-Renewable Resources (Non-Energy)

Franklin (OSDA) takes the total weight of the container material as a proxy for this measure. In more detailed analysis by Franklin Associates, it would be divided into its specific virgin material components. This measure has previously been called the weight of solid waste.

However, although weight provides one perspective, a pound of silica sand does not have the same market price (or relative scarcity) as a pound of resin.

An improved method for evaluating the non-renewable raw material variable would be to weigh each pound of material by its current market price, f.o.b. the container fabrication plant. This would constitute a better measure of relative scarcity.

From information supplied by industry representatives:

a) the average cost of the mixed input for glass in Ontario is about 2.5 cents a pound;

b) the U.S. retail price for resin is about 56 cents a pound.

On this basis, the purchase price of a pound of resin is approximately worth 22 times the purchase price of a mixed pound of input for glass bottles.

Factors not considered in the above price relationship include:

a) the resin transportation costs to Ontario;

b) the foreign-exchange rate adjustment for the resin price;

c) the relative future price relationships between these non-renewable raw materials.

It is better to measure the non-renewable raw material variable according to the relative Ontario purchase price for a pound of input, than on a straight pound-for-pound basis.

On the basis of the information given, a 20:1 ratio is used in this report, which reflects the fact that a pound of resin (the Ontario raw material for PET bottles) is worth about twenty times a pound of mixed input for glass. Additonal information may allow for a refinement of this ratio in subsequent analysis. (1)

Under a deposit-refund system, there would be resource conservation to the degree that non-refillable containers were recycled.

10.7 Litter

No statistics are presented in this report for littered family sized beverage containers. Franklin Associates Ltd. did not include this variable in its environmental analysis.

10.8 Air and Water Pollutants

The Franklin (OSDA) data indicates the levels of air and water pollutants in pounds for each container system. There is no differentiation between the types of air and water pollutants in the weight total.

In the Nine Container Study by Franklin Associates Ltd. (for the U.S. E.P.A.),there were thirteen possible atmospheric pollutants and nineteen possible waterborne pollutants. In each case, (i.e., air and water effluents) the individual pollutants were specified on a weight basis and then added to form a total of water pollutants, and separately, a total of air pollutants. It is these weights which are offered in the Franklin (OSDA) input.

However, this does not seem to be satisfactory method of evaluation. A pound of waterborne acid is given the same value as a pound of waterborne iron. It does not seem meaningful to measure each pollutant on an equal basis i.e., pound for pound. As a consequence, when two very different container substances are being evaluated, (i.e., glass versus plastics) more information is needed to make more meaningful comparisons for the air and water-borne effluents. As a result, the water and air effluent measures provided in the Franklin (OSDA) study are not used in this report,

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(1) For instance, the PET input could be measured according to the value of its petroleum requirements (i.e., before the resin is manufactured).

10.9 Industrial Solid Waste

Industrial solid waste includes in-plant wastes and mining wastes. Its measure is in cubic feet in the Franklin work. Since these wastes must be disposed of, the volume dimnesion would seem the appropriate measure.

10.10 Weighting of Environmental Variables

It is possible to adopt a weighting system for each environmental variable in order to develop an overall environmental index for each scenario. This method is not used in this report.

The environmental variables of post-consumer solid waste, container energy, and non-renewable raw materials are perceived to be the most important environmental variables in this report.

10.11 Non-Ontario Environmental Impact

One respondent made the point that since the PET resin was likely to be produced in the United States, then most of the adverse environmental impacts (i.e., resin energy, non-renewable raw materials, water and air production effluents) would fall outside Ontario, and this would give the PET container a much enhanced environmental rating for Ontario use.

If the PET resin were to be manufactured outside Ontario, then there is some merit in this viewpoint. There is, however, no reasonable way of segregating the Franklin (OSDA) input between countries. This could become an issue in every environmental profile analysis. In most cases, some of the total systems energy is also engaged in other jurisdictions.

When the final assessment is made, the fact that the resin could be manufactured outside Ontario is one positive factor for the PET (NR).

It should also be recalled, however, that Ontario imports silica sand. All environmental variables (except post-consumer solid waste and litter) would have to be modified before an "Ontario only," or a "Canadian only," environmental impact profile would be attainable. However, in environmental analysis, the most conventional format is to include a total environmental profile, rather than an environmental profile which would only incorporate the indigenous impact within a spatially bounded region.

10.12 Reclamation-Recycling: Other Systems

The only reclamation-recycling system considered in this report is the mandatory deposit-refund system for non-refillable containers.

Advocates of plastic packaging correctly point out that there is "embodied" energy in the PET(NR): about 9,000 BTU's per pound.

Although this is a positive point for any plastic package, the energy would not be reclaimed unless there were many mechanical resource recovery plants in Ontario, or unless incineration (with an energy recovery loop) plants were common. In fact, most of Ontario's post-consumer solid waste is landfilled and not treated through mechanical resource recovery stations or incinerators, and this position is not likely to change significantly in the near future.

Therefore, the increased use and reuse of refillable bottles and a deposit-refund system for non-refillable containers would seem to be the most promising waste management policy initiatives for carbonated soft drink packaging in Ontario.

10.13 The REPA Model

The resource and environmental profile analysis (REPA) undertaken by Franklin Associates Ltd. is an impressive set of analysis in which a comprehensive input-output matrix is presented. This is essential work to the formulation of an environmental impact study.

The criticisms set out in the earlier sub-sections do not fault the details provided in the REPA model. They do suggest that there are problems in some of the methods of aggregation for three of the environmental measures: non-renewable raw materials and air and water effluents.

An improved weighting system is needed for each of these environmental measures. A simple weight aggregation is not deemed either appropriate or satisfactory.

SECTION 11

ENVIRONMENTAL ASSESSMENTS

11.1 Scenario I: Refillables versus Non-Refillables (no deposit refund system for non-refillables)

In this initial scenario, a mandatory deposit-refund system is not established for the non-refillable containers examined. Break-even trippage (BET) levels are used for post-consumer solid waste and non-renewable raw materials. The energy analysis is based upon the container systems energy required for a beverage isoquant of 1,000 gallons of carbonated soft drinks.

A. Volume of Solid Waste (Primary Containers Only)

Break-Even Trippage Levels

	GL(NR)	PLGL(NR)	PET(NR)
GL(REF)	1.2	1.0	3.1
PLGL(REF)	1.3	1.0	3.3
AN(REF)	1.0	1.0	1.6

B. Container Energy

Energy Requirements for a Beverage Isoquant of 1,000 Gallons

Consumer Return Rate %	GL(REF)	GL(NR)* (10^6BTU's)	PET(NR)*
0	67.6	54.7	21.9
80	18.6	n/a	n/a
90	12.7	n/a	n/a
93	10.6	n/a	n/a

*Note: The Franklin (OSDA) analysis did not include PLGL (REF), PLGL(NR), or AN(REF).

C. Non-Renewable Raw Materials*
(Primary Containers Only)

	Break-Even Trippage Levels		
	GL(NR)	PLGL(NR)	PET(NR)
GL(REF)	1.3	1.0	1.0
PLGL(REF)	1.9	1.2	1.4
AN(REF)	2.0	1.2	1.5

* It is assumed that for a pound of material input, the price of resin is twenty times the price of the glass input.

D. Comment:

a) The BET levels for post-consumer solid waste and non-renewable raw materials depend upon assumptions indicated in Section 10.

b) Because there are no details for the elements in the energy system, it has not been possible to calculate BET levels for energy. Returned refillable containers require energy to transport and wash, and this energy input is a function of trippage. Therefore, the energy series are presented on a different basis and utilize the Franklin (OSDA) input.

c) In the Franklin Report to Goodyear,[1] the following table indicates the break-even trippage rates for the 2-litre refillable bottle against the 2-litre PET non-refillable.

	BET LEVELS	
	High*	Low*
Post-consumer solid waste (volume)	3.3	3.3
Total Energy	3.6	6.0

* The "high" scenario is the PET bottle with a base cup and a corrugated shipper, while the "low" scenario is a free-standing PET bottle with reusable plastic shippers.

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(1) Franklin Associates Ltd., Family-Size Soft Drink Containers - A comparative Energy and Environmental Analysis, Executive Summary, January, 1978, page 13.

11.2 Scenario II: Refillables versus Non-Refillables (with a deposit-refund system)

In this analysis, an 80% and a 90% return rate for the non-refillable container system is used. Break-even trippage levels are only relevant for post-consumer solid waste and for non-renewable raw materials. The energy analysis remains on an isoquant basis.

It is assumed that returned non-refillable containers are actually recycled.

A. Volume of Solid Waste (Primary Containers Only)

Break-Even Trippage Levels

	GL(NR)	PLGL(NR)	PET(NR)
PANEL A (80% Return Rate for NR's)			
GL(REF)	6.3	4.8	16.0
PLGL(REF)	6.7	5.2	17.2
AN(REF)	3.3	2.5	8.4
PANEL B (90% Return Rate for NR's)			
GL(REF)	12.0	9.6	28.8
PLGL(REF)	12.9	10.3	31.0
AN(REF)	6.3	5.1	15.2

B. Container Energy

Energy Requirements For A Beverage Isoquant of 1,000 Gallons

Consumer Return Rate %	GL(REF)	GL(NR) (10^6BTU's)	PET(NR)
0	67.6	54.7	21.9
80	18.6	42.4	11.9
90	12.7	40.9	10.6
93	10.6	40.4	10.3

C. Non-Renewable Raw Materials
(Primary Containers Only)

	Break-Even Trippage Levels		
	GL(NR)	PLGL(NR)	PET(NR)
	PANEL A (80% Return Rate For NR's)		
GL(REF)	6.4	3.7	4.7
PLGL(REF)	9.7	5.7	7.1
AN(REF)	10.2	6.0	7.5
	PANEL B (90% Return Rate for NR's)		
GL(REF)	12.7	7.5	9.4
PLGL(REF)	19.3	11.3	14.2
AN(REF)	20.4	12.0	15.0

11.3 Scenario III: PET(NR) Versus Other Non-Refillable Systems

In this scenario, the three types of non-refillable containers are examined under the assumption that mandatory deposit-refunds are not operative.

The environmental measures are specified in index numbers, with the environmental level of the GL(NR) being defined as a reference base of 100.

	Non-Refillable Containers		
	GL(NR)	PLGL(NR)	PET(NR)
	Index: GL(NR) = 100		
Environmental Variables			
1. Volume of Solid Waste (primary containers)	100	138	40
2. Container Energy	100	92 est.	40
3. Non-renewable Resources (primary containers)	100	103	34
4. Industrial Solid Waste	100	90 est.*	14

* Estimated from Franklin-Goodyear Report, op.cit., page 5.

11.4 Litter

Although litter is not perceived to be an important environmental variable for family sized containers, the following comments have relevance:

a) Without a mandatory deposit - refund system, some PET(NR), GL(NR), and PLGL(NR) containers would be littered.

b) PET(NR) and PLGL(NR) containers would not likely break in the litter stream. If broken, the PET(NR) would not have dangerous shards.

c) If PET(NR) containers were littered without a deposit-refund system (like unbroken glass bottles), they would remain for many years.

SECTION 12

ENVIRONMENTAL FINDINGS
(1.5L and 2L Container Systems)

12.1 Introduction

These environmental findings are based on the analysis presented in Section 11 for the volume of solid waste, container energy, and non-renewable raw materials. In some comparisons, there is no data for the container energy. The finding on litter is included last.

12.2 Scenario I: Refillable Consumer Systems Versus Non-Refillable Container Systems (no deposit-refund system for non-refillables)

Finding I:

When the refillable and non-refillable containers of the same container material are compared (i.e., GL(REF) versus GL(NR), the refillable system would be environmentally preferable in each comparison on the basis of post-consumer solid waste and non-renewable raw materials at trippage levels in the order of only two.

Finding II:

Without the existence of a mandatory deposit-refund system for non-refillable containers, the refillable container systems would all be significantly preferable to each of the non-refillable container systems (including the PET container system) at reported trippage levels for all three environmental variables.

Comment:

Finding II is also consistent with the findings of Franklin Associates Ltd. in their PET study for Goodyear, the results of which are included in Section 11.1, for the volume of post-consumer solid waste and container energy.

12.3 Scenario II: Refillable Container Systems Versus Non-Refillable Container Systems (with a mandatory deposit-refund system for non-refillables)

Finding III: GL(REF) versus PET(NR)

If a mandatory deposit-refund system were introduced;

a) and the PET(NR) were to achieve an 80% return rate, then the PET(NR) would approach the environmental performance of the GL(REF) on the basis of post-consumer solid waste and container energy, and would be environmentally inferior on the basis of non-renewable raw materials at reported trippage levels for the 1.5L GL(REF).

b) and the PET(NR) were to achieve a 90% return rate, then the PET(NR) would appear to be environmentally superior on the basis of post-consumer solid waste, about equal with respect to container energy, and inferior with respect to non-renewable raw materials at reported trippage levels for the 1.5L GL(REF).

Finding IV: GL(REF) Versus GL(NR)

If a mandatory deposit-refund system were introduced, and a 90% return rate were achieved, then the GL(REF) would be environmentally superior to the GL(NR) for post-consumer solid waste, container energy, and non-renewable raw materials at reported trippage levels for the 1.5L GL(REF).

12.4 Scenario III: PET(NR) Versus Other NR Systems

Finding V

On the basis of post-consumer solid waste, container energy, and non-renewable raw materials, the PET(NR) container system would be significantly environmentally preferable to the GL(NR) and the PLGL(NR) container systems at a zero (or an identical) return rate for each system.

Comment:

The existing Ontario regulations allow the GL(NR) container in the 1.5L size under a mandatory availability and an equal shelf space regulation. However, under these conditions, there is almost no Ontario availability or sales of the 1.5L GL(NR).

12.5 Litter

Finding VI

Although the frequency for littering family-sized beverage containers is much less than for single-drink sizes, a deposit-refund system would minimize the quantity of family-sized non-refillables which were littered and which remained in litter.

SECTION 13

COMMENTS ON A DEPOSIT-REFUND SYSTEM FOR NON-REFILLABLE CONTAINERS

13.1 Effectiveness of a Deposit-Refund System

An effective return system for non-refillable containers would depend upon the following factors:

a) the deposit-refund level,

b) whether consumers take their used containers to retail stores, or to depots,

c) the commercial market for the non-refillable container material,

d) the degree of contamination in the reclamation cycle.

The first two factors would influence the consumer's propensity to return empty non-refillable containers for deposit-refund. For 2-litre PET(NR) containers, the deposit-refund level in Oregon is 5¢; in Michigan is 10¢, and in Alberta is 30¢.

The last two factors reflect possible differences between reclamation and actual recycling operations. Leakages have occurred at this stage (i.e., consumer returned packaging has been landfilled).

The previous environmental analysis indicates that the higher the consumer return rate and the higher the recycling rate, the greater the environmental advantages would be for a non-refillable container system. Experience in the United States has indicated that there are end-use products for the reclaimed PET resin. For these reasons, consideration should be given to the development of a commercial Ontario industry recycling system if the PET(NR) were admitted to the Ontario market.

13.2 Foregone Deposits on Non-Refillables

When a refillable container is not returned for deposit-refund, the industry would apply the foregone deposit funds to the acquisition of a new refillable container. However, bottlers and distributors would also receive these benefits under a deposit-refund system for non-refillable containers when consumers failed to claim their refunds. In this case, there would not be a replacement container.

The annual level of foregone deposits for non-refillable containers could be substantial in Ontario. It would depend upon the rate of consumer returns, the deposit level and upon the degree of market penetration for the PET(NR) into Ontario.

Consideration should be given to the advantages and disadvantages of establishing a separate audited fund for the foregone deposits if a deposit-refund system were established for non-refillable containers. The uses of this fund could be "dedicated" to waste management activities.

SECTION 14

POLICY OPTIONS

POLICY OPTION 1: Status Quo

There would be no major permanent changes made in the existing regulations. The PET(NR) would not be allowed into the Ontario market. The industry's voluntary agreement would be continued but the time frame would be necessarily extended. Any new type of refillable container could be introduced in the existing retail sizes.

POLICY OPTION 2: Investigate New Acceptable Refillable Primary Container Types

The Ontario carbonated soft drink packaging initiatives have depended upon the existence of acceptable refillable containers in each retail size. The existing 1.5 litre "narrow" neck refillable glass bottle fails the "tipping" test in its present form, and uncertainty prevails over the acceptability of the 1.5 litre "wide" neck refillable bottle and all 750 ml. refillable bottles.

This policy option suggests that serious attention should be directed towards the development of other refillable container types for Ontario, which would meet the federal regulations. The environmental profile for each possible alternative refillable container (including modifications to the existing refillable glass bottles) should be developed.

If an acceptable refillable container system were not available, Ontario's carbonated soft drink packaging programme would have to be significantly redirected.

POLICY OPTION 3: Allow the PET(NR) Into the Ontario Market:

A: with conditions

B: without conditions.

The policy options with respect to the admission of the PET(NR) container are outlined in Table 14-1.

Possible conditions for admission of the PET(NR) are:

(i) mandatory availability (Scenario 2)*

(ii) mandatory deposit-refund system to retail stores or depots (Scenario 4)*

(iii) mandatory industry commercial recycling programme (Scenario 5)*

(iv) mandatory foregone deposit fund for "dedicated" waste management uses (Scenario 6)*.

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* The scenario numbers refer to scenarios which have been outlined in Table 14-1.

POLICY COMBINATIONS FOR 2-LITRE PET CONTAINER

TABLE 14-1

SCENARIOS

No.	Description	Code	Key Elements								
			Size Changes	New N/R Bottle	Refill/NR Voluntary Accord	Mand. Avail. 750 ml Size	Equal Display Area	Deposit Refund 2 L NR (Retail)	Deposit Refund 2 L NR (Depot)	Mand. Recycle NR	Fund for Foregone Deposits
1.	Status Quo	Stat Quo	No	No	Same	Same	Same	n/a	n/a	n/a	n/a
2.	Allow 2 litre PET with mandatory availability	PET(Mand.)	Add 2 L	Yes	Same or modified	Same with 2 L PET included	Same with 2 L PET included	No	No	No	No
3.	Allow 2 litre PET with no 1.5/2 L Mandatory Availability	PET(FREE)	Add 2 L	Yes	Revised	No	No	No	No	No	No
4.	Allow 2 litre PET with mandatory deposit refund										
	a) Retail Stores	PET:DR(RET)	Add 2 L	Yes	Revised	No*	No*	Yes	No	No	No
	b) Depots	PET:DR(DEP)	Add 2 L	Yes	Revised	No*	No*	No	Yes	No	No
5.	Allow 2 litre PET (as in #4) with mandatory recycl'g	PET:REC	Add 2 L	Yes	Revised	No	No	Yes or Yes		Yes	Yes
6.	Allow 2 L PET (as in 5) with foregone deposit fund	PET:FUND	Add 2 L	Yes	Revised	No	No	Yes or Yes		No	Yes

* Mandatory availability and equal display area could be required on options 4 to 6.

Scenario 1 (in Table 14-1) refers to the status quo option and Scenario 3 allows the PET(NR) container to be admitted without regulatory conditions. The existing two types of non-refillable containers (e.g., glass and bi-metallic cans) must meet several conditions under the existing Ontario environmental programme.

The environmental assessment analysis in Section 11 has clearly showed that the environmental posture for a non-refillable system is greatly improved when a mandatory deposit-refund system for non-refillable containers (including the PET container) exists.

POLICY OPTION 4: Develop Environmental Criteria for the Acceptance of Non-refillable Containers for the Ontario Carbonated Soft Drink Industry

The intention of this policy option would be to develop a set of environmental guidelines for non-refillable containers. In this way, industry would be aware of the criteria, and this would work to reduce industrial uncertainty over which new non-refillable container types would be acceptable in the Ontario carbonated soft drink market.

SECTION 15

INDUSTRIAL IMPACT COMMENTS

15.1 Introduction

As stated earlier, changes in beverage packaging containers and container systems would usually have important impacts on the consumer and industrial sectors. For instance, there would be differential employment effects under a mandatory deposit-refund system, depending upon whether non-refillable containers were to be returned to retail stores or to depots by consumers. These employment impacts have not been examined in this study.

15.2 OSDA Submission

The OSDA Submission indicated that there could be about 100 new jobs created in the plastics container industry in Ontario; new investment would be required and a new technology could be imported into Ontario.

The submission, however, did not allow for loss of Ontario employment in the glass container industry, nor did it include the employment impact and investment consequences for regional Ontario bottlers.

15.3 Final Comment

When the expected impact from environmental policy initiatives are being examined, the assessment should include both environmental and non-environmental variables. For beverage container programmes, the benefit-cost matrix should include the anticipated effects in the environmental health, industrial, consumer and government sectors.

SECTION 16

SOME KEY QUESTIONS RAISED

1. Can an acceptable plastic-coated glass refillable bottle be developed in the 1.5 litre and the 750 ml. sizes for Ontario? Alternatively, can an all plastic refillable container be developed for Ontario carbonated soft drinks?

2. If a mandatory deposit-refund system were to be established for family-sized non-refillable containers:

    a) should consumers return them to retail stores or special depots?

    b) should the regulation be extended to the 300 ml. size?

    c) should consumer foregone deposits (for non-refillable containers) be segregated in a separate fund for "dedicated" waste management purposes?

3. Can an effective commercial reycling progamme be established in Ontario for returned (under a mandatory deposit-refund system) PET containers?

4. What long run changes should be made (or may have to be made) in Ontario's carbonated soft drink packaging programme because of the new federal regulations?

SECTION 17

FINAL COMMENTS

1. Refillable Container Systems

With the experienced environmental advantages from the refillable glass bottle, there should be urgent attention allocated to determine whether "acceptable" refillable containers will be available for Ontario in the 1.5 litre size and in the 750 ml. size.

2. PET(NR)

(a) With a refillable container alternative, the most environmentally attractive profile occurs for the PET(NR) when:

(i) a mandatory deposit-refund system for the PET(NR) exists;

(ii) consumer return rates for the PET(NR) approach and/or exceed 80%;

(iii) an effective commercial industry recycling programme is developed for Ontario.

At extremely high consumer return rates for the PET(NR), it would appear to be environmentally preferable to the 1.5 litre glass refillable bottle, at reported trippage levels, on the basis of post-consumer solid waste and about on an equal basis for container energy.

(b) With no refillable container alternative, the PET(NR) is environmentally superior (on all counts and to a significant degree), according to the Franklin assessment, over the existing 1.5 litre GL(NR), which is an allowable Ontario container.

3. Multi-Discipline Interests

In the design of the future carbonated soft drink container system for Ontario, and in the design of the Ontario regulations directed towards this system, it would be extremely helpful if three major interest groups (health, environment and private sector industry) worked in concert. In this way, a long run approach could be adopted which could satisfy the minimum needs of each set of interests.

APPENDIX A

THE TRIPPAGE CONCEPT

As indicated in Section 4.3, the formula for trippage is:

$$T = \frac{1}{(1-APRR)}, \text{ where APRR}$$

represents the average propensity to return refillable bottles for deposit refund.

The value range for APRR is from 0 (i.e., there are no consumer returns) to 1 (i.e., the unlikely situation that all refillable containers are returned).

The following table (Panel A) shows the relationships between trippage and average consumer return rates. The extreme sensitivity between these two variables, when consumer return rates exceed 90%, is clearly shown in this table. For instance, if APRR were to increase from 95% to 96%, trippage would increase from 20 to 25.

At the opposite spectrum, if APRR were 0 (i.e., no refillable bottles were returned), then the value of trippage becomes 1 (i.e., the refillable becomes a one-trip container).

In Panel B, a second factor is examined: the rate of in-plant rejection through breakage or for other reasons. Bottlers have reported in-plant breakage in bottling plants at around 1% and occasionally as high as 2%. In the table (Panel B), an in-plant rejection rate of 2% has been used, which would appear to be at the high rate of the breakage range.

T* is defined as the modified trippage rate when the in-plant rejection (IPR) factor is included:

$$T^* = \frac{1}{1 - (APRR - IPR)}$$

The value of APRR is reduced by the value of IPR to obtain the reissue rate for refillable bottles.

Depending upon the environmental variable and what happens to the rejected containers at the bottling plant, it may be appropriate to use T or T* in the environmental assessment.

TRIPPAGE CHART

Panel A			Panel B		
Average Consumer Return Rate %	APRR	T(1)	In-Plant Rejection Rate (IPR)	Re-issue Rate	T*(2)
0	0	1	0.02	n/a	n/a
50	0.5	2	0.02	0.48	1.9
80	0.8	5	0.02	0.78	4.5
90	0.9	10	0.02	0.88	8 1/3
95	0.95	20	0.02	0.93	14.3
96	0.96	25	0.02	0.94	16 2/3
97	0.97	33 1/3	0.02	0.95	20
98	0.98	50	0.02	0.96	25

(1) $T = \dfrac{1}{(1-APRR)}$

(2) $T^* = \dfrac{1}{1 - (APRR - IPR)}$

APPENDIX B

Outline of

Consumer & Corporate Affairs Canada Involvement

(Safety Standards for 1.5 Litre Carbonated Soft Drinks)

A. Minister's Press Releases

1. June 28, 1979

(a) "Federal Consumer and Corporate Affairs Minister Allan Lawrence today announced his intention to reduce the breakage hazard of 'torpedo-shaped' narrow-neck 1.5 litre glass containers of soft drinks."

(b) "Mr. Lawrence said the regulations will be in place shortly. In the meantime, he appealed to retailers to halt the sale of all 'torpedo-shaped' narrow-neck 1.5 litre bottles, and requested manufacturers to cease their distribution. He added he will discuss with the provinces any problems that might be caused by provincial legislation concerning bottles."

2. July 5, 1979

(a) "Federal Consumer and Corporate Affairs Minister Allan Lawrence warned today that if all bottlers, distributors and retailers do not fully co-operate in removing 1.5 litre 'torpedo-shaped', narrow-neck soft drink bottles from the marketplace, he will have no choice but to initiate more direct and drastic action."

(b) "We have identified the type of bottle that is a hazard, and it is certainly in the interests of the public that those bottles be immediately removed."

(c) "Bottlers should not be using, and retailers should not be selling these danger bottles."

3. August 7, 1979

(a) "Federal Consumer and Corporate Affairs Minister Allan Lawrence today announced that a safety standard for 1.5 litre or larger carbonated soft drink bottles has been established under the Hazardous Products Act, and is effective immediately."

(b) "There will, therefore, be an absolute ban on the importation, advertising and sale of any such containers that fail the test. I expect, on the basis of the tests conducted by the department to date, that all of the nationally-marketed carbonated soft drink bottles of a 1.5 litre size will be affected."

(c) "The safety standard applying to a 1.5 litre or larger carbonated soft drink bottles constitutes only the first step in providing protection from flying glass. Broader-based standards covering other pressurized glass containers are also being developed, and will eventually be made operative so that all such containers will have standardized safety tests."

B. Findings From the Tipping Hazard of Returnable Glass Carbonated Beverage Bottles, (June, 1979)
(Consumer and Corporate Affairs Canada)

1. "Between March 1970 and May 1979, 19 explosions of glass, carbonated beverage bottles were reported to the Product Safety Branch." "Seven of these definitely involved 1.5 bottles which were introduced four years ago."

2. According to the Canadian Soft Drink Association, the gallonage sales by container size for Canada are:

Container Size	Percentage of Gallonage Sales
(a) 1.5 litre	20%
(b) 750 ml.	50%
(c) 10 oz. (284 ml.)	5%
(d) cans (284 ml.)	25%
Total	100%

3. 1.5 Litre Sizes:

	"wide neck"	"narrow neck"
Diameter	107 mm	96 mm
Height	330 mm	335 - 340 mm
Metal Screw Caps	39 mm	29 mm
Weight (Filled)	2.77 kg	2.70 kg
Center of Gravity (from base) of Filled Container	12 cm(approx)	14 cm(approx)

4. Summary of test results shown: (See Tables I to IV)

	Refillable Bottle Size	Number of bottles tested	Number which broke on first impact	Number which did not break after 10/11 drops
(a)	1.5L narrow neck	22	21	ø
(b)	1.5L wide neck	29	2	19
(c)	750 ml. (approx)	37	7	24
(d)	300 ml. (10 oz.)	16	ø	16

5. For Canadian bottlers to convert to "wide-neck" bottles, the cost is estimated at:

Bottle float and cases: $15 million

New washing, bottling and handling equipment: $35 million.

(Note: Value of shipments in 1978 for Canadian Soft Drink Industry is $916 million - Statistics Canada)

6. "Tipping Report" makes no mention of environmental factors for beverage containers.

7. Conclusions to Report

(a) "When tipped on a hard surface, some bottle designs, and in particular the narrow-neck 1.5 litre versions, are very prone to explode.--Depending on many factors, velocities achieved by particles vary considerably, and in any event, are sufficient to allow skin penetration."

(b) "Squat bottles of thicker glass do perform better than more cylindrical-shaped containers of thin glass and smaller glass bottles are safer."

(c) --"life in service (maybe) a major consideration in bottle fragility."

C. Regulations Under Hazardous Products Act:

1. Short Title: "Carbonated Soft Drink Containers Regulations"

2. Application: "Glass containers of a capacity of 1.5 litres or more, containing a carbonated soft drink, that do not meet the requirements of the Carbonated Soft Drink Containers Regulations.

(Added to Part I of the schedule to the Hazardous Products Act.)

3. Requirement of Regulations:

(a) "When a container is tested in accordance with the test procedures described in Schedule I, no piece or part of the container shall penetrate the aluminum foil referred to in that schedule."

(b) "If the container is intact: repeat the steps...". (Section 8 of Schedule I, Test procedure)

Note: The test is to be repeated once with the bottle turned 180°.

D. Discussions with Jim Black (Director) and Dr. K. Gupta of the Product Safety Branch, (August 9, 1979)

1. Concern is degree of glass fragment retention when filled bottle breaks.

2. "Narrow-necked" 1.5 litre bottles fail test on first drop in almost 100% of cases. "Wide-necked" Coke bottles fail in about 5% of tests. Therefore, differential performance exists.

3. Although regulation is absolute, there is likely to be a tolerance level which has yet to be determined. It may be about a 3% failure rate (i.e., if a container fails less than tolerance level, then it would be deemed an acceptable container.

4. Immediate task is to obtain samples of 100 Coke 1.5L refillable bottles from a variety of bottling plants and perform test.

5. Perceived methods to satisfy fragmentation for a failing glass refillable bottle:

(a) paper label
(b) plastic glove
(c) plastic coating.

6. Next Steps:

(a) Increase sophistication of test and probably develop a "drop" test.

(b) Extend investigation to other pressurized glass bottles:

(i) 750 ml and 300 ml carbonated soft drink bottles
(ii) beer bottles
(iii) wine bottles.

E. Summary of "Drop Test"

From Environmental Impact of Nitrile Barrier Containers: LOPAC: A Case Study*
(Monsanto Company)

Container Type	Container Size	Estimated Mean Failure Height	
		Steel Plate	Vinyl-Covered Wood Floor
(a) LOPAC (acrylo nitrile)	(i) 10 oz.	6' plus	7'
	(ii) 32 oz.	4'	4'
(b) Glass (Plasti-shield)	32 oz.	2' plus	6' plus
(c) Uncoated glass bottles	various sizes	½' to 1½'	6' plus

These results are related to tests performed in the United States by Monsanto, before it was about to market the non-refillable 32 oz. acrylo nitrile bottle for carbonated soft drinks.

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* See pages 61 and 62.

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